Wells pentrating deep horizons in West Virginia, western Pennsylvania, and eastern Ohio encounter a limestone and chert unit at the general Onondaga level. This unit is the eastern subsurface extension of the Columbus limestone of Ohio and, probably, the analogue of the Onondaga limestone of New York. It is also the precise equivalent of the Huntersville chert. Commercial gas was discovered in it (1936) along the Chestnut Ridge anticline of southwestern Pennsylvania, and a recent Oriskany test well on the same structure encountered rock pressure of 3,275 pounds in the Huntersville. Most likely the chert is a reservoir only because of brecciation. The extreme brittleness of the Huntersville is attested on the outcrop by strong fragmentation wherever it is folded. This fact suggests its potential value as a gas and, possibly, an oil reservoir wherever deformation has caused brecciation at depth.

17. F. A. NICKELL, U. S. Bureau of Reclamation, Denver, Colorado
Geology Applied to Engineering

Engineering geology from an obscure beginning achieved most of its growth in the period of unprecedented construction chiefly during the past 15 years. The responsibility and points of interest of the engineering geologist are distinct in some respects from those in the better known fields of applied geology. However, basic considerations and methods of interpretation differ only in adaptation and emphasis. A few major projects of national importance illustrate typical problems.

18. CARL A. HEILAND, Colorado School of Mines, Golden, Colorado
Applications of Geophysics in War

War-time applications of geophysics come under the heading of military operations and location of essential minerals. In the combat zone, sound ranging helps to locate hostile guns and to adjust friendly artillery. Listening devices determine the approach of submarines or airplanes. Buried munition dumps, shells, and bombs can be located by radio detection devices. Vessels at sea may establish their position by radio-acoustic ranging. Planning of fortifications and harbors and location of construction materials will be aided by seismic refraction, electrical resistivity, and dynamic ground testing. The same methods are applicable to problems involving the construction of railroads, highways, bridges, tunnels, and munitions plants. For the last, added protection is possible by static-ground-resistance investigations. Salvage operations, location of shipwrecks and practice weapons, are aided by echo-sounding and radio methods.

In the second group, geophysics is concerned with the location of water, fuels, and strategic minerals. Water may be found under favorable conditions by electrical and seismic methods, and water wells may be tested by electrical logging. Geophysical foundation investigations are applicable in irrigation, flood-control, and power projects. Magnetic, gravimetric, seismic-reflection, and electrical well-logging methods occupy a prominent place in oil exploration. Coal and lignite deposits may be mapped by geophysical methods. Magnetic, electrical, gravimetric, and seismic exploration methods are now used in a systematic government-sponsored exploration program to uncover vitally needed deposits of bauxite, chromite, manganese, mercury, nickel, tin, and tungsten.

19. HERBERT HOOVER, JR., United Geophysical Company, Pasadena, California
Contribution of Geophysics to the National Effort

20. K. C. HEALD, Gulf Oil Corporation, Pittsburgh, Pennsylvania
Origin of Oil

21. L. L. NETTLETON, Gulf Research and Development Company, Pittsburgh, Pennsylvania
Geophysical Evidence on the Mechanics of Salt Domes

In 1934 the author presented a theory of salt-dome formation and illustrated it with a model which indicated: (1) that the motive force causing salt uplift is essentially the gravitational force resulting from the fact that the density of the salt is less than that of the surrounding sediments and (2) that both salt and sediments behave essentially as highly viscous fluids. The present paper considers the experimental and theoretical work, largely by others, carried out since that time which has a bearing on this fluid-mechanical theory.

Hubbert in 1937 derived, from dimensional considerations, the numerical relations between the physical constants of a model and its prototype in nature which should be fulfilled to give true dynamic similarity. Dobrin in 1941 determined physical constants of a fluid salt-dome model, applied Hubbert's analysis, and established that the model

fulfilled the dimensional criteria. By measurement of flow rates and viscosities in a model, he determined the equivalent viscosity for the sediments arriving at a value which is in reasonable accord with determinations by other means. The experiments by Griggs and the thermodynamic development of the physics of stressed solids by Goranson in recent years have interpreted the physical properties of rock material, in terms of long time stresses. This work has clarified and evaluated certain fundamental properties such as "strength," "plasticity," etc. that are directly applicable to the fluid mechanical postulate of salt-dome formation. Finally, recent extensive geophysical work and drilling around salt domes have revealed the frequent existence of rim synclines which are a natural consequence of the fluid-mechanical theory and which were relatively unknown or unrecognized as such at the time of the earlier paper. All of this work seems to confirm the general hypothesis that salt-dome formation is largely a fluid-mechanical process.

A dynamic model illustrating the fluid mechanics of dome formation will be available when the paper is given, and it is hoped it can be seen in operation in connection with other exhibits of the convention.

22. R. DANA RUSSELL, Louisiana State University, Baton Rouge, Louisiana
Salt Domes of Bienville Parish

The salt domes of Bienville Parish, Louisiana, are classic examples of the shallow or piercement-type dome, and have been prominent in the geologic literature of the Gulf Coast since the discovery of Cretaceous fossils at King's Dome in 1867.

Detailed surface mapping shows the domes to be round to oval in plan, with progressively younger sediments exposed in concentric rings outward from a central depression. Rim synclines and partial rim anticlines are also evident. Deformation of Pleistocene deposits serves to date the last period of uplift on most of the domes.

Neither the ring of upturned sediments nor the adjoining anticline has been adequately explored by drilling on most of the domes, so they may still be considered as potential producers.

23. PAUL WEAVER AND COMMITTEE, Gulf Oil Corporation, Houston, Texas
JOHN S. IVY, Geologist, Houston
D. PERRY OLCOTT, Humble Oil and Refining Company, Houston
JOHN M. VETTER, Pan American Prod. Company, Houston
GEORGE S. BUCHANAN, Consulting, Houston
Statistical Analyses of Crude Oils of Tertiary Age in the Gulf Coast of Texas and Louisiana as They Vary with Depth, Producing Formations, and Structural Types

24. FREDERIC H. LAHEE, Sun Oil Company, Dallas, Texas
Discovery Rate and Relation of Wildcatting to the Discovery of New Reserves

The total number of wildcats drilled in 1941, in the states covered by this report, was 3,264, and the footage drilled was 11,615,085, as contrasted with 3,038 holes and 10,144,870 feet, respectively, in 1940. The average depth of hole increased from 3,339 feet to 3,559 feet for all states covered, and from 4,209 feet to 4,372 feet in the southern states.

This résumé on wildcatting is followed by a study of discovery rate in the eleven states of Arkansas, California, Illinois, Indiana, Kansas, Louisiana, Michigan, Mississippi, New Mexico, Oklahoma, and Texas. Discovery rate is measured by the relations between wildcatting and the discovery of new reserves during the last half decade. Except for a slight rise, in 1941, in the curves expressing rate of discovery, there has been a decline since 1937.

25. F. M. GETZENDANER, Consulting Geologist, Uvalde, Texas
Problem of Pre-Trinity Deposits in South Texas

Probability of Permian deposits in the East Texas basin is suggested. Attention is directed to the new section of Jurassic, Neocomian, and Trinity deposits in the region of East Texas, Louisiana, and Arkansas, arranged by the Shreveport Geological Society and Ralph W. Imlay, with new names for some of the formations; and the presence of Jurassic deposits in Limestone County, Texas, on the west side of the basin.

Evidence is presented of the progressive increase in basinward slopes on the basement and dips on the sedimentary beds, westward across Arkansas and East Texas, thence southwestward to the locality of San Antonio, thence continuing westward again to the Rio Grande. For this 700 miles of generally uniform trend it is postulated that the